Arthroscopic superior labrum anterior-posterior repair in military patients


The purpose of this retrospective study was to determine the efficacy of arthroscopic superior labrum anterior-posterior (SLAP) repair in a military population. In this study, 27 patients (of 30 consecutive patients) who had suture anchor repair of a type II SLAP lesion were evaluated at a mean of 30.5 months postoperatively. Fifteen patients had isolated tears, whereas twelve also had a concomitant diagnosis. At follow-up, the overall mean American Shoulder and Elbow Surgeons score was 86.9 points and the mean University of California, Los Angeles score was 30.4 points. The results were excellent in 4 patients, good in 20, and fair in 3. Of the patients, 96% returned to full duty (mean, 4.4 months). Patients treated for concomitant diagnoses and a SLAP tear had significantly higher American Shoulder and Elbow Surgeons scores and tended to have higher University of California, Los Angeles scores than those treated for an isolated SLAP tear. The findings indicate that arthroscopic SLAP repair in military patients results in a high rate of return to duty. The results suggest that concomitant shoulder pathology should be treated at the time of SLAP repair. (J Shoulder Elbow Surg 2007;16:300-305.)

With the increased utilization of shoulder arthroscopy, tears of the superior labrum anterior-posterior (SLAP) are becoming a more recognized cause of shoulder pain and dysfunction. Given that the biceps anchor may play a role in shoulder stability, it has been suggested that repair of a SLAP lesion should be performed in patients who are routinely involved in strenuous activity. Whereas earlier reports described reattachment of the torn labrum via direct suturing, a staple, or absorbable tack devices, current techniques have evolved into arthroscopic SLAP repair with suture anchor fixation. Biomechanical studies have shown the fixation strength of suture anchor repair to be secure, and recent reports have found favorable results with this method of repair.

Because of the unique physical demands within the military, a variety of shoulder disorders occur in this population. Recently, we have recognized an increasing prevalence of SLAP tears causing dysfunction in active military patients. The purpose of this study was to examine the results of arthroscopic SLAP repair in an active-duty military population.

METHODS

Subjects

Thirty consecutive cases of type II SLAP repairs were studied in accordance with the standards of our institutional review board. The criteria for inclusion in the study were (1) a type II SLAP tear as confirmed by intraoperative assessment; (2) shoulder pain, instability, or mechanical catching interfering with strenuous or sporting activities; (3) symptoms unresponsive to at least 3 months of nonoperative treatment; and (4) the patient being an active-duty member of a military service during the entire course of treatment. The exclusion criteria were (1) a history of frank shoulder dislocation or evidence of a Bankart lesion, (2) any labral tears other than type II SLAP lesions, (3) rotator cuff tear greater than 50% in thickness (or repairable), (4) previous shoulder surgery, and (5) acromioclavicular disease (impingement, arthropathy, or instability). Between October 2001 and June 2003, a retrospective review identified 164 shoulder arthroscopies performed on active-duty military patients. Of these patients, 42 had a SLAP lesion. Two patients with a type I SLAP lesion, one with a type V SLAP lesion, and nine with concomitant acromioclavicular pathology were excluded. The remaining 30 patients comprise the population in this study.

Patient examination

The preoperative history was reviewed for a mechanism of injury (overt trauma or repetitive trauma) and a self-reported visual analog scale pain score from 0 (no pain) to 10 (as bad as it could be). Physical examination included active range of motion, active compression tests, and cranck tests, and examination maneuvers to identify subacromial impingement and to rule out gross instability or acromi-
oclavicular disease. Magnetic resonance imaging (MRI) with or without contrast arthrography was performed when the clinical diagnosis or surgical plan was uncertain. The MRI study was suggestive of a SLAP tear when the labrum was detached and displaced from the superior glenoid or when a branched linear or stellate focus of abnormally increased contrast signal intensity was seen between the articular cartilage margin and attachment of the labrum or biceps anchor on coronal oblique views. A presumptive diagnosis of a superior labral tear was made from any combination of at least 3 of the following: (1) a history of trauma (acute or repetitive), (2) internal pain or clicking, (3) positive active compression test or compression-rotation test, and (4) suggestive appearance on MRI for SLAP tear. The indications for surgery were shoulder pain, instability, or mechanical catching interfering with the performance of strenuous or sporting activity. Symptoms were unresponsive to activity modifications, anti-inflammatory medications, and a minimum of 3 months of a formal rehabilitation regimen.

Surgical procedure

All surgeries were done with the patient under general anesthesia in the lateral decubitus position. Initial diagnostic arthroscopy was performed from a standard posterior portal, and specific sites of examination included the gleno-humeral articular surfaces, the biceps tendon and anchor, the entire glenoid labrum, and the rotator cuff. An unstable superior labral tear was confirmed when the labrum could be displaced by more than 5 mm off of the articular cartilage margin of the glenoid when tension was placed on the biceps tendon with a probe. An unstable superior labral tear was confirmed when the labrum could be displaced by more than 5 mm off of the articular cartilage margin of the glenoid when tension was placed on the biceps tendon with a probe. A single vertical stitch from each anchor was placed around the inner edge of the labrum centrally and through the capsulolabral tissue peripherally via an arthroscopic piercing instrument loaded with a shuttle suture (Linvatec, Largo, FL) or by use of a suture lasso (Arthrex) (Figure 2). A sliding arthroscopic knot reinforced with alternating half-hitches was used to secure the labrum to the glenoid (Figure 3). Arthroscopic subacromial decompression with coracoacromial ligament resection was performed in patients identified to have concomitant subacromial impingement on preoperative assessment. Partial-thickness rotator cuff tears were debrided with a motorized shaver when considered to be less than 50% in thickness.

All patients were prescribed the same postoperative rehabilitative protocol (Table I) under the supervision of a physical therapist. Sling immobilization, pendulum exercises, and active elbow and wrist exercises were initiated postoperatively for the first 3 to 6 weeks. In addition, at 3 to 6 weeks, passive and active-assisted range-of-motion exercises were begun in forward elevation, internal rotation, and external rotation with the arm adducted. After 6 weeks, progressive strengthening of the rotator cuff and the scapular stabilizers was begun. Three months after the operation, patients progressed to an aggressive exercise program. Full participation in throwing sports was allowed after 6 months. Criteria to return to full active duty were (1) greater than 80% of preoperative motion regained, (2) greater than 80% of strength regained (as measured by the patient’s self-reported ability to achieve at least 80% of the number of consecutive pushups or pullups achieved on his or her last preinjury fitness test), and (3) ability to perform the physical requirements of the patient’s military
occupational specialty confidently (the criteria for which varied widely depending on specific job requirements).

Follow-up evaluation
At a minimum of 24 months postoperatively, patients were evaluated by use of the American Shoulder and Elbow Society (ASES) score and the University of California, Los Angeles (UCLA) scoring system. The ASES score is tabulated from a self-reported visual analog scale pain score (from 0 to 10) and a questionnaire on which the patient evaluates his or her activities of daily living. The UCLA shoulder score divided results into the following categories, as described by Ellman et al: excellent (34-35 points), good (28-33 points), fair (21-27 points), and poor (0-20 points). Patients were further evaluated with regard to return to full active duty (ie, achieved or not achieved), level of return to competitive sports (ie, higher, same, lower, or unable), and overall satisfaction (ie, satisfied or not satisfied). Descriptive data are reported as the number of patients in each subgroup and percentages. The differences in mean scores between 2 subgroups were analyzed with the unpaired t test. Multivariate analysis was done by use of a test.

RESULTS

Of 30 patients, 27 (90%) were available for clinical follow-up at a mean of 30.5 months (range, 24-42 months). Of the repairs, 24 were performed on the dominant side and 6 on the nondominant side, including 27 right and 3 left shoulders. The mean age at treatment was 31.6 years (range, 22-41 years). Preoperatively, 15 patients had a history of overt trauma and 15 had a history of repetitive trauma. All patients reported their primary symptom as pain, 5 had mechanical catching, and 2 complained of pain with weakness. None had a history of frank dislocation. Symptoms had been present for a mean of 10.4 months (range, 4-16 months).

On preoperative physical examination, 28 of 30 patients had a positive active compression test. Seventeen had a positive compression-rotation test. MRI findings were suggestive of superior labral pathology in 24 of 26 patients. Two MRI scans did not show a SLAP tear that was suggested by history and physical and confirmed at surgery (false-negative rate, 7.7%). A superior labral tear associated with a spinoglenoid cyst was identified on MRI in 4 patients. None of these 4 patients exhibited any physical signs of neurologic deficit. Eight other patients were noted to have signs of stage II subacromial impingement.

Intraoperative findings
None of the shoulders had increased translation exceeding grade 1 with the load-shift and inferior sulcus maneuvers compared with the contralateral side. Associated findings at arthroscopy included 6 patients with chondromalacia of the humeral head or glenoid articular surface, 8 with subacromial bursitis, and 4 with partial-thickness tears of the rotator cuff. Two were articular-sided, 2 were bursal-sided, and all 4 were in patients with signs and symptoms of subacromial impingement syndrome identified preoperatively. There were no Bankart tears, Hill-Sachs lesions, or full-thickness rotator cuff tears. A mean of 2.2 anchors per patient (range, 1-4) were placed for repair.

Clinical results
The clinical results are summarized in Table II. The mean pain score improved significantly, from 5.0 preoperatively to 1.3 postoperatively (P = .0001). The overall mean ASES score at follow-up was 86.9 points (range, 53.3-100 points). The mean postoperative UCLA score was 30.4 points (range, 22-35 points). On the basis of UCLA scores, there were 4 excellent, 20 good, 3 fair, and 0 poor results.

Each patient regained full active forward flexion and internal rotation compared with the preoperative motion, and abduction and external rotation were within 5° of the preoperative measurements. There was no difference in UCLA (P = .20) and ASES (P = .30) scores depending on the type of bioabsorbable suture anchor used.

Of 26 patients who participated in competitive sports at a recreational level, 20 (76.9%) returned to the same level or higher whereas 6 (23.1%) returned to a lower level. No patient had to give up recreational sports because of the shoulder. Of the 30

Figure 3 Suture anchor fixation of the labrum is completed and probed for stability.
Patients with an isolated SLAP tear tended to have lower mean UCLA scores (30.2 points) than those with associated diagnoses (30.8 points) \( (P = .5 \text{ [not significant]} \). Of the 15 patients in the group with an isolated SLAP tear, 13 \( (87\%) \) had good or excellent results and 2 had a fair result. Of the 12 patients in the combined group \( \text{SLAP tear with other diagnoses} \), 11 \( (92\%) \) had good or excellent results and 1 had a fair result. The time to return to duty and length of follow-up were not significantly different between subgroups \( \left( P = .6 \right. \text{ and } P = .4 \text{, respectively} \).}

**Complications**

No intraoperative complications, nerve deficits, or wound infections occurred in any patient. No clinical signs of stiffness were found during the postoperative period. There were no reoperations. Of the 3 patients with fair results, none reported a reinjury. All 3 reported no pain at rest, but each had pain with strenuous activities when the upper extremity was used above shoulder level. One of the three had undergone an isolated SLAP repair and attempted to return to full military duty at 6 months postoperatively. Within 3 months of his return to duty, the preoperative symptoms of pain and catching recurred without new injury. He was dissatisfied with how the clinical symptoms were affecting his work performance and was medically separated from the military.

**DISCUSSION**

Failure to repair unstable SLAP lesions has been shown to be unsatisfactory, with deteriorating results over time.\(^2,4,24,32\) The accepted standard of treatment for unstable type II SLAP lesions has evolved into arthroscopic repair with suture anchors.\(^8,12,13,18,31\)

A recent cadaveric study compared the biomechanical strength of suture anchor repair with that of a bioabsorbable tack.\(^5\) No significant difference in stiffness, load to permanent displacement, and load to ultimate failure was seen, but the investigators noted...
an advantage in the ability to control precise suture placement with the suture anchor system. Another recent cadaveric study suggests that normal range of motion and shoulder stability can be restored after arthroscopic suture anchor repair of a type II SLAP lesion.

Our study achieved overall favorable clinical results with regard to shoulder scores and return to duty after arthroscopic suture anchor repair of type II SLAP lesions. Whereas the UCLA scoring system was originally established to assess results of rotator cuff repair, its use in previous studies of arthroscopic SLAP repair with suture anchors allows for direct comparison with our results. Morgan et al. reported good or excellent results in 97% of 102 patients at 1-year follow-up based on UCLA scores after repair of type II SLAP lesions, including 46 of 53 overhead athletes having excellent results. Kim et al. reported that 94% of their patients had good or excellent results at a mean follow-up of 33 months (mean UCLA score, 33.4 points) after repair of 34 unstable, isolated SLAP tears, including 91% of patients regaining their pre-injury level of function. Rhee et al. reported a mean UCLA score of 32.3 points at a mean follow-up of 33 months after suture anchor repair of isolated SLAP tears in 30 of 44 patients. The mean UCLA score of 30.4 points in active-duty military patients seen in our study at a mean follow-up of 30.5 months compares favorably with these previous reports, including good or excellent clinical results in 87% of patients (13/15) with isolated SLAP tears.

Whereas the daily physical demands of each active-duty patient vary widely depending on his or her military occupational specialty, all full-duty service members must perform upper body strength testing (either pushups or pullups) as part of a semiannual fitness evaluation. Therefore, this study is unique in that each patient has a previously documented objective pre-injury level of fitness. In fact, this information was useful in determining when the patient was able physically to return to full duty. Eventually, 97% of our patients regained at least 80% of their previous level at a mean of 4.4 months postoperatively and were able to resume full duty at that time. Although we did not use the pre-injury fitness score in the assessment of the final results, this information may serve as a simple reference for postoperative evaluation in future studies. Although none of our military patients was an elite athlete, most participated in recreational sports, and all of these athletes resumed playing their sport, including 76% returning to at least the same level as preoperatively.

This study included patients with concomitant diagnoses of subacromial impingement syndrome, partial-thickness rotator cuff tear, and spinoglenoid cyst formation in addition to the SLAP tear. However, we believe that the SLAP tear contributed to each patient’s symptoms based on the findings of the history (all patients had some form of trauma), physical examination (positive active compression test in 28/30 patients), and MRI (positive for SLAP tear in 24/26 studies) and, ultimately, arthroscopic confirmation of the lesion in all shoulders. The rate of associated shoulder pathology found with SLAP tears is reported to be as high as 76%. We found that patients treated for an isolated SLAP tear had significantly lower ASES scores (and tended to have lower UCLA scores) at follow-up when compared with those who had concomitant treatment for additional diagnoses. The findings suggest that SLAP tears do not always occur in isolation and that concomitant subacromial impingement or spinoglenoid cysts should be treated at the time of SLAP repair.

The strengths of this study include a military population of nonsedentary adults, use of a uniform surgical technique, and use of a standard postoperative therapy protocol in all patients. We also used standard evaluation scores that allow comparison of our results to prior studies. We readily acknowledge the inherent limitations of a retrospective review and the lack of a comparison group of patients undergoing arthroscopic debridement or nonoperative treatment. Although the total number of patients was relatively small, the sample represents the current prevalence of this condition in a military population.

In conclusion, arthroscopic SLAP repair via a suture anchor technique is a reliable procedure with respect to clinical results and postoperative return to full duty and recreational activity in a military population. Furthermore, concurrent treatment of associated shoulder pathology does not compromise ultimate clinical results.

REFERENCES


